Worksheet 1 Logic Gates and truth tables

Task 1

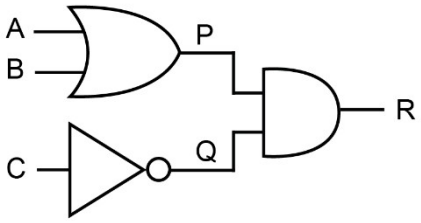
1. Write the following Boolean expressions using Boolean notation:

   (a) (A AND B) OR NOT (D AND E)

   (b) NOT A AND NOT (B OR C)

   (c) (A AND B) OR (B AND (NOT C))

2. (a) Complete the truth table for the following logic circuit.



(b)

Input A	Input B	Input C	P = A ˅ B	Q = ¬C	Output R = P ˄ Q
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

Write a Boolean expression to represent this circuit in terms of A, B and C, using
Boolean notation.

3. Draw logic circuits to represent the following Boolean expressions, and in each case say what is the output if A = 1, B = 0 and C = 1, showing the output from each gate.

   (a) Q = ¬((A ˅ B) ˄ C)

   (b) Q = A ˄ (¬(B ˅ C))

Task 2

4. Draw the truth tables for the following logic circuits:

   (a) A ⊻ B

Input A	Input B	Output Q

   (b) (A ˄ ¬B) ˅ (¬A ˄ B)

Input A	Input B	P = A ˄ ¬B	Q = ¬A ˄ B	Q = A ˅ B

   What do you notice about the output in each case?

(c) Draw the logic circuit for the expression: Q = (A ˄ ¬B) ˅ (¬A ˄ B)

5. (a) Write the following Boolean expression using Boolean notation:

   (A XOR B) AND (NOT (C XOR D))

   (b) Draw the logic diagram using XOR, AND and OR gates, showing the output from each gate if the inputs for A, B, C and D are all 1.